But the agency in distribution being the same in Professor Walker's philosophy as in the old, does he differ as to the result, the point to which the ultimate tendencies of the whole social movement are directed, or what we may call the economic destiny of man? Notwithstanding some criticisms of detail, we understand Professor Walker to accept Ricardo's law of diminishing returns from the soil and the Malthusian law of population, — the cardinal points on which the modern system of political economy hinges. Applying these laws in that state of complete competition which he aims at and others are said to assume, can he help coming to the same conclusions as to the ultimate condition of society, and of the wages-class as one of its constituent parts? If not, — and it is hard to see where he can logically diverge from the line taken, for example, by Mr. Mill, — then we must conclude that neither in its process nor in its economic result does his philosophy of wages present anything substantially new.

It is, however, in our opinion, no disparagement of Professor Walker's book to say that it gives no really new solution of the wages question. That question probably has a long life before it. But in his attack upon it the author has made a contribution to economic literature of great value. As a statement of the actual conditions which affect the well-being and independence of the class of laborers for wages, of the causes which impede a complete and free competition on their part, and of the important position which moral influences hold among economic agencies, his work is systematic, original, and strong. As a repository of facts collected from a wide range and of considerations drawn from actual observation, it is of too much consequence to be neglected by any one who hopes to make a thorough study of the main question. Our present limits have obliged us to confine ourselves to a brief notice of the general theoretical bearing of the book, and we regret our inability to give to it in its practical aspects that more extended examination, which its great intrinsic value and the interesting special topics discussed by it alike merit.

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2. — *Functions of the Brain.* By David Ferrier, M. D., F. R. S. New York: G. P. Putnam's Sons. 1876. 8vo. pp. xv, 323.

This is a remarkable work. Upon scientific evidence, it tries to show that definite parts of the brain are distinct centres of movement, sensation, and ideation. It therefore makes an epoch in science, and the English speaker is proud of the fact that a book which will be read by the world appears in his language. His experiments are simply marvellous.

They light up the hidden centres of the brain as by a calcium light. The man is, in a sense, a Columbus of the cerebrum. He steers his vessel of discovery straight into the internal currents of the hemispheres, where hardly a navigator had ventured, and reports of unknown islands and cities, — islands of force, cities alive with the business of manufacturing and exchanging ideas and emotions. No scholar of mind or of physiology can afford to be without this volume. In a few sentences we give its main drift.

If we take the body and begin with the spinal chord, above that we have the medulla oblongata, then the cerebellum, then the mesencephalic centres, pons varolii, optic thalamus, the small basal ganglia, corpora striata, etc., and, finally, the hemispheres of the cerebrum in front of all. Through the back part of the spinal chord nerves of sensation lead from the body towards the brain; from the brain and other centres at the front part of the chord lead nerves of motion. Cut off the head, still the two sets of nerves of the spine by reflex action will produce a vast variety of bodily motions. The spine alone, therefore, is the seat of a vast number of bodily reflex movements. Cut out the medulla oblongata, and the movements of the chest, and some movements of the face and blood-vessels, are obliterated. The medulla is the seat of the movements of chest, face, and blood-vessels. Cut out the cerebellum and optic thalamus, and the co-ordination and equilibrium of the body movements, also some of the movements of the eyes, ears, and nostrils, are destroyed. These organs are the seat of equilibrium, co-ordination of locomotion, and similar motions. A frog will right himself, and a bird fly, with the cerebrum out. But Ferrier denies that the cerebellum is the organ of the sexual sense. He proves that the labyrinth of the ear plays a most important part in balancing the movements of the body. A rhythm in the ear will produce reflex rhythmical movements of the body. He shows that the optic lobes are the seat, not of the sense of sight, indeed, but of the co-ordination of retinal impressions with special motor-reactions. And he contends that none of these lower organs can be the seat of consciousness, as Carpenter and others have claimed, but that this resides in the cerebrum.

But now go to the tower of the human house, the cerebrum, and what results? Here is where Ferrier claims discoveries. He believes he has located in the back brain the centre of hunger, in the middle and side lobes the centres of leg and arm-motion, smell, taste, touch, sexual desire, etc.; and in the forehead the great intellectual power we call attention. The brain is but a piano with distinct keys of passions and ideas for volition to play upon. And this is the way he reaches his facts. The mind wings its arrow of volition through the cerebral sub-

stance to the nerves, and the organs obey. And similarly the pole of an electrode is an arrow that, touching the brain, subserves the office of volition. Stand behind a monkey with the skull partly removed, apply the battery, and what have you? The back part of the brain is not very susceptible to impressions. But experiments go to show that it is the seat of hunger, and that the viscera intimately connected with it are the seats of some mental disorders, hypochondriasis, and melancholia. Put now the electrode on a point of the top of the head, at the back part, and you excite movements of the legs in locomotion. Farther along, towards the front, and on a line with the last, the electrode excites movements of the arms and special movements of the legs. Farther along we have the centre of movements of the eyes and head. Apply the pole down the side of the brain near the middle, and you move the angles of the mouth. Back of this at the side is the centre of vision; back of this, that of hearing. Push now the electrode to the centre of the brain, to the subiculum cornu ammonis, and you find smell; near that, taste; near that is the hippocampal region, and here is touch; near that is the centre for the sexual desire. While, if you apply the battery to the frontal lobe, you have no excitation, as with the middle region, still all experience locates there the intellectual centres.

Such is the picture, such the cerebral piano. And Ferrier is strenuous in his statements that there are no doubts about there being these different keys. For he removes these various centres of the brain, and the particular movements and sensations they evoke are gone. Volition does not excite them. Both by excitation and destruction of a lobe, he arrives at sure results.

Now the question is, Are these wonderful things true? If so, science has found a new world. The popular phrenology is blown to atoms. The discovery almost deserves to be ranked with those of the lines of the spectrum and of conservation of force. But there are those who deny that there are definite motor and sensory centres and special lobes of the brain. Lewes says, the brain is one and the mind one, and cortex and gray matter can do the same things. Nerves of sensation leading towards the brain can be nerves of motion from the brain. These effects of the electrode on the lobes come from mere *disturbance* of the brain. Give the monkey time after the removal of the alleged brain-centres of vision, touch, etc., and he will recover the lost powers. Ferrier says, if a dog had been taught to do one exceptional act with his paw, and you then should cut out the part in the brain which causes the motion of that paw, he could not do the act at all. But Goltz says he has done it after the destruction of the lobe claimed

as the centre of the motion has taken place. Ferrier says, if the vision-centre is removed, the animal will not see with the eye. Lewes says, he will. Thus some doubts are thrown over the new revelation. Still it is to be said that Ferrier is a master. His experiments are so numerous, varied, and complete, and his analogies for his theory, drawn from other parts of the nervous system, are so weighty, that the theory in some shape will probably stand. At any rate, it opens a fruitful field for future discovery. Lewes admits that the new theory may be a starting-point for a new anatomy of the brain. And why not admit both theories, that the brain and mind are units and thus act to some extent independently of the special centres, and that mind and brain have each differing parts, and that the parts of the brain are to some extent necessary to motion, sensation, and thinking. We must sometimes think in words, and sometimes we think without them. Why may not special parts of the cortex act like words for thought, and be material aids and resting-places for the mental and sensory forces?

The connection which exists between mind and brain Ferrier affirms in the most thorough-going way. He says, there is with the mind an unbroken material succession. The brain-centre of vision is to the optic apparatus and in some sense to the mind, what the sensitive plate is to the camera of the photograph. There is not only a brain-centre for the eye, but in the same centre we must locate definite tracks for memory and combinations of memory of all visible objects. Without that track the car of recollection would have no road to go on. We think with the left brain, because, being right-handed, the opposite side of the body must supply it with cerebral power. Sensory centres are not only organs of consciousness of immediate sensory impressions but *registers* of special sensory experience as memory or ideal combinations. Perhaps various viscera are represented in the interior lobes of the brain. Motor centres are not only centres of differentiated movement but organic bases of *memory* of the movements and seats of ideal reproduction. Ideal movements are as important as ideally revived sensations. Our idea of a form comes not only from a revived impression of sight but also from a revived or remembered movement of the eye. And this he states as a great law. In organic cohesions between sensory and motor centres we have the basis of intellectual and volitional acquisitions. If a blind deaf-mute had to associate thoughts with movements of the hand, then by death of the cerebral motor centres of the hand, he could not talk with his hand and would be impeded in thought. Nay, he says, we think abstractions through words. Words are definite oral articulations. Now destroy the brain-centres which co-ordinate the power of oral articulation, and you destroy the power to think abstractions. Man, as a fact, can only think particulars.

And finally he locates in the front of the brain the grand power, attention. The faculty of "inhibition" or power to stop a revived sensor or motor train is the fundamental element of attention and control of ideation. By this he commands all past sensations and movements, sights, sounds, emotions, events, and thus makes life's history the source of personal experiences. Attention, therefore, gives the storehouse of thinking, imagining, picturing, and just as there are centres of sense and of motion in the middle and interior lobes of the cerebrum, so there may be and ought to be definite tracks and centres in the front brain for special thinking and feeling, for the poet, artist, philosopher, and scientific man. Still let us say that Ferrier has the good sense to admit that the brain is not consciousness, nor is feeling, as Taine would say, the inner side of motion, nor is a motor centre of thought thought itself. We feared that, true to the degrading materialistic influences of the hour, his theory might lead him so far as to hint that possibly the brain could secrete the infinite and a lobe secrete religion or a truth of Christianity. But he is too wise for this. Though physiology has encroached a little on the province of the mind, it is still refreshing to think that if we were cannibals and ate human brain, we should never devour the source of the Godhead of will, the moral law and conscious spirit, — spirit, which rides above all matter, which is its sole source, and which alone allows us to formulate its laws.

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3. — *Correspondance de* H. DE BALZAC, *1819–1850.* Paris: Calmann Lévy. 1877. 2 vols. 16mo.

HITHERTO our means of knowing about Balzac have been very meagre, especially in view of the fact that he died at the height of his fame, while yet a middle-aged man, less than thirty years ago. Here was one of the greatest of the French writers of the present century about whose life we knew hardly more than a few anecdotes, which rather aroused than satisfied curiosity, showing as they did what a mere glance at the book-shelf would tell us, how ardent and enthusiastic a worker he was, and, moreover, how completely he lived in a world of the imagination. His correspondence, however, which has just been published, throws a great deal of light on the circumstances of his career, admitting us into his confidence with regard to his hopes and disappointments in the most unreserved way. It is sometimes said by the cynical that every great man nowadays writes his letters to the address of posterity; but this would be by no means true of Balzac, for it is easy to see that there was no such intention lurking in his mind when